Journal of the Society of Arts.

FRIDAY, APRIL 15, 1859.

NOTICE TO LOCAL BOARDS.

Forms No. 1 and No. 2 (see Appendix to the Examination Programme) have been issued to the Secretary of each Local Board, and careful attention to them is particularly requested.

EXAMINATIONS, 1859. — LOCAL BOARDS.

The following Local Boards have been appointed since the last announcement:—

For Frome.

Rev. D. Anthony, B.A., Independent Minister.
Mr. Bailey, Master of British Schools.
Mr. Bioletti, Master of National School.
Mr. Ellis, Master of Endowed Blue Coat School.
Mr. Alfred Haynes, Mechanics' Institution, Frome, *Secretary.*

For Hitchin.

Rev. L. Hensley, President.
Mr. W. Hawkins, Vice-President.
Mr. D. Lloyd.
Mr. F. Lucas.
Mr. W. Lucas.
Rev. G. M. Musgrave.
Mr. J. Hack Tuke.
Mr. Joseph Pollard, Highdown, near Hitchin, *Secretary.*

For Leeds' Mechanics' Institution and District.

Mons. Brocard.
Rev. C. H. Collier, M.A.
Rev. Thomas Hincks, M.A.
Mr. James Hole.
Mr. Oliver.
Herr Reunert.
Mr. Scattergood, M.R.C.S.
Mr. H. E. Kincaid, } *Secretaries.*
Mr. John Pickering. }

For Wakefield.

Rev. Goodwyn Barmby.
Rev. J. S. Eastmead.
Mr. W. Williamson, Registry, Wakefield, *Secretary.*

EXAMINATION PRIZE FUND, 1859.

The following are the Donations up to the present date:—

	£	s.
John Ball, Examiner in Book-keeping (2nd donation)	5	5
Harry Chester, Vice-Pres. (2nd donation)	5	0
C. Wentworth Dilke, Vice-Pres., Chairman of Council (4th donation)	10	10
T. Dixon	1	1
Frederick Edwards (annual)	1	1
J. G. Frith, Mem. of Council (2nd donation)	5	5
F. Seymour Haden (annual)	2	2
W. Haldimand	10	10
Edward Highton (annual)	2	2
James Holmes (annual)	1	1
Henry Johnson (2nd donation)	25	0
London Committee of the Oxford Middle Class Examinations	5	5
Charles Ratcliff (annual)	10	10
Rev. Dr. Temple	6	6
A Teacher	5	0
Matthew Uzielli	50	0
Rev. A. Wilson	2	2

EXHIBITION OF INVENTIONS.

The Society's Eleventh Annual Exhibition of recent Inventions will be opened on Monday the 25th inst.

CONVERSAZIONI.

The Council have arranged for two Conversazioni during the present Session; the first, on Saturday, the 7th May, at the Society's House, the card for which will admit the Member only; the second, on Saturday, the 28th May, at the South Kensington Museum, the card for which will admit the Member and two ladies, or one gentleman. Cards for each of these evenings have been issued. Members who have not received them are requested to communicate with the Secretary of the Society of Arts.

Members of Institutions who are anxious to attend either of these Conversazioni, are requested to apply to the Secretary of the Society of Arts, through the Secretary of the Iustitution to which they belong.

OPENING OF GALLERIES OF ART IN THE EVENING.

The following letter has been addressed, by direction of the Council to the Secretary to the Trustees of the National Gallery.

Sir,—I am directed by the Council of the Society for the Encouragement of Arts, Manufactures, and Commerce, to make the following appeal to the Trustees of the National Gallery:—

The Chancellor of the Exchequer has stated in Parliament, that the Turner and Vernon collections of paintings and drawings, in charge of the Trustees of the National Gallery, are to be exhibited to the public in the new galleries which have been built, and are now almost completed, in connexion with the Museum at South Kensington. In those new galleries, however, no provision has been made for artificial light, and, therefore, an apprehension is felt that it is the intention of the Trustees that the collections in question shall not be open to the public except during the hours of daylight.

The Council begs leave to represent to the Trustees that the whole of the collections already in the Museum at South Kensington, including the Sheepshank's gallery of paintings and drawings, have been hitherto systematically opened to the public of an evening, as well as by day, under the authority of the Committee of Council on Education, and have been visited of an even-

ing by very large numbers of persons, whose conduct has been irreproachable.

The Council considers it highly important to the interests of arts and manufactures, that the national collections of the fine arts shall be open as freely as possible to the view of the public in general. There can be no difficulty in guarding against risks of fire, or other injuries incidental to the use of artificial light. There must always be large numbers of persons, residents or visitors in London, who, being occupied throughout the day in business, can only visit a gallery of art in the evening; and, if all these persons are excluded at the only time which is available for them, and this exclusion is established by the Trustees of the National Gallery, in exception to the beneficial rule which has hitherto prevailed, with excellent results, at South Kensington, a large amount of grave dissatisfaction, it is feared, must necessarily be the consequence.

The Council of this Society confidently hopes that the Trustees of the National Gallery may assent to the proposition, that the establishment and maintenance of museums and galleries at the public expense is commendable, and, indeed, justifiable, only where the fullest possible opportunities of seeing and profiting by the collections are afforded to the public; and experience has proved that, whenever any exhibition interesting to the great masses of the people is open to them, without any unnecessary limitations, it is visited by them in large numbers; and their behaviour, in all the essentials of good conduct, may safely challenge a comparison with that of the very highest classes.

The Council has much pleasure in laying before the trustees a copy of a resolution, which was passed unanimously by the representatives of the three hundred Institutions united to this Society, at the last annual conference, on the 24th of June last, viz.:—

"That this Conference requests the Council of the Society of Arts to bring under the consideration of Her Majesty's Government the question whether the National Museums and Galleries cannot and ought not to be opened of an evening, in order that they may be accessible to those numerous classes of the community who, contributing towards the expenses of maintaining the National Museums and Galleries, and being well able to profit by access to them, are at present practically debarred from visiting them, because they are open only during the day."

The Council has no doubt that the trustees are not only willing but anxious that the national collections intrusted to their charge should be seen and used by the public as freely as possible, and the Council earnestly requests the trustees to consider whether they cannot take advantage of the temporary exhibition of the Turner and Vernon Collections at South Kensington, to allow them to be open to the public of an evening as well as by day.—I am, &c.,

P. LE NEVE FOSTER, Secretary.

NINETEENTH ORDINARY MEETING.

Wednesday, April 13, 1859.

The Nineteenth Ordinary Meeting of the One Hundred and Fifth Session was held on Wednesday, the 13th inst., Wm. Fothergill Cooke, Esq., in the chair.

The following candidates were balloted for and duly elected members of the Society:—

Norton, John | Weeks William Henry
Varley, Cromwell Fleetwood

The following Institution has been taken into Union since the last announcement:—

The British Horological Institute.

The Paper read was—

ON PROFESSOR HUGHES'S SYSTEM OF TYPE-PRINTING TELEGRAPHS AND METHODS OF INSULATION, WITH SPECIAL REFERENCE TO SUBMARINE CABLES.

By Mr. H. Hyde.

The several phenomena which have been manifested in the working of long submarine telegraph cables, demonstrate the necessity of improving the insulation of the wires, and of economising the transmission and recording of symbols. Imperfect insulation not only implies a diminution of the electric current, but may, and frequently does, increase to a total loss, and the cable becomes useless.

The insulation being good when the cable leaves the manufacturer, it is subject to so many accidents before it reaches the bottom of the ocean, that the chances are greatly in favour of a long line receiving some damage, which cannot be repaired after it is laid down. More perfect insulation, and a self-restoring power which should make the cable itself, even at the bottom of the ocean, repair any accidental defect, are most important desiderata in the science of ocean telegraphing.

The great expense of a length of cable, of any construction, sufficient to join England and America, must necessarily be such as to render economy of time in the transmission of messages a matter of primary importance.

Through a single wire, the waves of the electric force can only follow one another in single file. Whatever may be the time occupied in the transmission of a single wave, it is of no small importance, whether it takes from five or six, or only a single wave, to communicate the signal of any letter of the alphabet. The short experience of the working of the Atlantic cable has demonstrated the importance of these positions. I need therefore offer no apology to the members of the Society of Arts, for bringing before them the methods by which Professor Hughes seeks to improve the insulation of submarine and other wires, to render them self-repairing, and to economise and render at the same time the means of despatch accurate and self-recording.

First—Insulation.

Gutta percha has been found to be the best insulation for long submarine lines. This substance, however, is more or less porous; minute flaws may exist, which do not show themselves until some time after the immersion of a cable. This was exemplified by Mr. Henly, who discovered a flaw in his submarine cable, which did not show itself until it had been three or four days under water. To meet these defects, to fill up any minute pores in the gutta percha, and also to cure any accidental fracture or puncture of it, Professor Hughes introduces a viscid semi-fluid substance, of a non-conducting character, between the conducting wire and the gutta percha, or the wire may first be coated with gutta percha, and the viscid fluid introduced between the layers of gutta percha. As soon as a puncture is made in either of the gutta percha coatings, the semi-viscid fluid oozes out. It is of such a nature, that it hardens when it comes in contact with the surrounding water.

This hardening or coagulating property allows no more of the fluid to ooze out than is necessary to fill the fracture, and at the same time to glue and unite the separated parts of the gutta percha.

The first feature in this form of cable is its self-restoring power; but it has another, and perhaps more important one. It has been shown, I think by Professor Faraday, that a fluid which cannot be decomposed by electricity is the most perfect insulator. Should this be demonstrated in practice, the invention of this form of cable must be valuable as a means for greatly increasing the non-conducting power of the medium surrounding

the conducting wire. It is well known that cables become defective in insulation after being submerged for some time. It has been supposed that the forces of the electric current burst the gutta percha covering under certain circumstances. It has also been urged that, in consequence of this tendency, battery power should be used instead of induced currents.

Professor Hughes has demonstrated that voltaic currents exert no mechanical force whatever upon the insulating coating of a conducting wire.

If there be a defect in the coating it may be enlarged by strong currents, either voltaic or induced. But, if there be no pore or crack through which the current can first commence its work of destruction, no voltaic current would exert sufficient force to tear a piece of paper. This has been shown by putting a piece of cable, three feet long, made upon Professor Hughes's plan, into a bath of salt water. Its complete insulation was tested by a delicate galvanometer and a battery of 500 cells. A fracture, an inch long, was then made through the gutta percha and the viscid substance, allowing the salt water to reach the wire; the galvanometer immediately was deflected from zero to 90°, showing dead earth.

In the course of five or ten minutes the viscid substance worked its way around the uncovered wire, and oozed out to the water through the fracture. It then coagulated, and thus repaired the injury, and completely restored the insulation. The whole force of the current from the 500 cells was kept constantly passing into the wire during the whole of this operation.

In illustration of the varied effects of different descriptions of fractures upon submerged cables, it may be instructive to note that if the conducting wire be made bare by a fracture of considerable size, having breadth as well as length, the immediate effect will be dead earth, or the instantaneous deflection of the needle to 90°. If the fracture be fine, or narrow, the effect will be a deflection of the needle to a greater or less extent, say from 70 or 90°, with a constant vibration of from five to ten degrees, or even more. This deflection and the vibrations will continue as long as the current is kept upon the wire, and often resemble the vibrations produced by a manipulator. This peculiar phenomena may, in some degree, account for the peculiar vibrations which so much puzzled the electricians during the short life and last moments of the Atlantic cable. These vibrations are probably produced by the decomposition of water by the electric current. The hydrogen gas escaping from the point of contact with the wire in an elongated bubble fills the fracture while passing through it, thus alternately opening and closing the circuit.

Secondly—Instruments.

In the early history of electric telegraphing, inventors were impressed with the advantages of using the alphabet in general use for transmitting communications, instead of characters or symbols, a mode which naturally suggested itself as the best, if practicable.

While electrical knowledge was confined to but few, mechanical knowledge, as applicable to its development, was also limited in the same or a still greater ratio. Hence, the mechanical means by which electric currents were made to convey or record signals were crude and simple, and the work was, if not cheaply, at least slowly, roughly, and often inaccurately done.

Among the earliest applications of electro-magnetism to telegraphic purposes, was the vibration of a magnetic needle to the right or left, at the will of the operator, by passing an electric current through the apparatus, or around the needle.

These vibrations are arranged into a code of signals, and the receiver spells off the message from the moving needle, and translates the signals to an amanuensis, who commits them to paper. But in the event of errors by this process, there is nothing to show whether the sender's hand was correct, or the receiver's eye undeceived, or the copyist's ear unerring, or, if a difference arises between them, the evidence may be equally in favour of each. To ascertain who is in fault is difficult, the instrument being visual or non-recording. This primitive method is now generally used in Great Britain. On the Continent, however, Morse's self-recording instrument is generally used.

The main features of this instrument consist in making a temporary magnet of a piece of soft iron, by passing a current of electricity through it, attracting an armature attached to one end of a lever, thus pressing a stile upon the other other end against a strip of paper moved by clockwork at an uniform rate of speed. By this means the manipulator is enabled to record, both at the home and distant stations, symbols, consisting of short and long lines, with blank spaces. These hieroglyphics are translated by the receiving clerk, written out, and enclosed to the person for whom the message is intended.

The Morse instrument is used upon many of the American lines. A roman type-printing instrument, the invention of Mr. House, is also used to some extent in America. It is more rapid than the Morse, printing accurately twelve to fifteen hundred words an hour in ordinary working, and is therefore approved upon lines which have a great amount of business.

It is, however, more complicated than the Morse or the Hughes' instruments, and requires an immense battery power to work it, so much so that it is not practicable, upon the best air or overground lines, for circuits of more than 150 miles, while upon underground or submarine wires it has not, and I believe cannot, be worked thirty miles.

The House instrument is based upon the step-by-step motion, or that the number of waves sent shall determine the letter to be printed. The type is made to revolve by means of a treadle, but is checked at each letter by an escapement, which only allows it to move one letter at a time.

This escapement is moved by the flow of compressed air upon alternate heads of a plunger. The passage of air is governed by a valve attached to the armature of the axial electro-magnet, each wave of the voltaic current causing an action of the magnet, and consequently of the plunger and escapement, by the air force.

Compressed air is used to get greater power on the escapement, as the electric current would be too weak to move the escapement, whilst sufficient to move the armatures and valve. In the transmission of a message, the operator sending it, checks a circuit breaker at a certain number of waves, and this stops the type-wheel of the distant instrument by means of the escapement; and, as soon as stopped, a press is unlocked, which imprints the letter.

This unlocking of the press is very ingenious, its action depending on the motion of the type-wheel. The main constituents of this instrument are the transmitting apparatus, a compound axial magnet, and a manual power by which the instruments are kept in motion.

The instruments thus concisely described, as well as all minor ones hitherto worked with one wire, require an average of five or more electrical impulses or waves, or the time equal to this number, to transmit one letter.

The recording in roman type each letter of a message by a single wave, upon one wire, is the triumph of the Hughes' system. To accomplish it, several requisites are necessary, which it may be proper to state, and then proceed to show how they are each obtained, and, united in one harmonious whole, producing that life-like automaton present to demonstrate before you what is advanced, and practically speak for itself in plain English.

These requisites are, first, synchronous motion; secondly, an electro magnet, by which the timing of the electrical wave may be accurately measured; thirdly, a writing apparatus, by which the message may be correctly, rapidly, and easily transmitted; fourthly, a printing apparatus, by which the operator can record the message

unerringly upon his own instrument, as well as upon the one at the distant station.

Many inventors have attempted to make an instrumment, by which a letter could be sent by one wave, but without success. One reason was, that they had no governor of sufficient velocity and accuracy, to produce rapid synchronous motion.

Professor Hughes applies a vibrating spring to govern his instrument. It is a well-known law that a certain number of vibrations produces a certain musical tone; therefore, if two or more springs have the same tone they must necessarily have a similar number of vibrations in the same time. The instruments are kept in motion by a weight acting upon a train of wheels, the spring governor acting upon them by means of an ordinary escapment.

These vibrations may succeed each other with any degree of rapidity required. They are regulated by a small weight attached to the spring, and raised or lowered until the number of vibrations or desired tone is produced. This can be done easily and quickly, although the instruments may be any number of miles apart—say between London and Paris, or Ireland and America.

The type-wheels of the instruments now exhibited, revolve at the rate of one hundred and twenty revolutions per minute, and the governor makes fifty-six vibrations for each revolution of the wheel.

The Magnet.

The Hughes' magnet is of peculiar construction. A permanent magnet polarizes the cores of an electro magnet, and holds an armature in contact with its poles. A spring is attached to this armature, and so adjusted as to exert a counteracting power a little weaker than the force of the magnetic attraction. If, therefore, the magnetic force be diminished, the armature is removed from the poles of the magnet by the force of the spring.

The arrangement is such that the current of electricity passing through the coil when the circuit is completed, induces an opposite magnetism to that of the permanent magnet. The electrical force, therefore, which works this instrument, need not be sufficient to induce such a degree of magnetism, as to render the core sufficiently magnetic to attract an armature to its poles—the practice in all other recording telegraphs. For instance, if the cores of the electro-magnet, polarised by the permanent magnet, have a holding force upon the armature of ten, and the spring attached to the armature be adjusted with an opposing force of nine, then a currrent of one reducing the force of the electro magnet, would cause the spring to rise with the force of nine.

This arrangement can in practice be so nicely adjusted as to work with a very feeble current, and accurately measure the timing of the electrical wave. The armature being mechanically restored to contact with the poles, has the advantage of being acted upon by the maximum power of the electro-magnet, instead of a power lessened by more than the square of the distance the armature has to be attracted, as is the case in the relay magnets used in connection with the Morse and other systems.

Transmitting Apparatus.

The letters of the alphabet, as well as a dot and a blank, are marked on twenty-eight keys, arranged like those of a piano, save that they are alternately black and white. These keys correspond to twenty-eight holes arranged in a circle on the horizontal floor or table of the instrument, immediately in front of the keys. Each key is connected by a lever with a little steel knob, which, when the key is pressed down by the finger, rises up through one of the holes. An arm, connected with a vertical shaft, sweeps over the twenty-eight holes. If a key marked with a particular letter be touched, the knob corresponding with this letter rises, the revolving arm passes over it, and for the instant closes the circuit, and allows an electrical impulse to be transmitted. This impulse, by arrangements which will be described in the printing apparatus, causes the particular letter to be recorded on a slip of paper in printer's ink. The instant the arm passes over the little raised knob the circuit is broken, and if the finger were held a hundredth part of a minute on the key, the hand would pass again over the knob, and the letter would be repeated. To prevent this the hand carries, after the portion of it which rides over the knob and completes the metallic contact which closes the electrical circuit, a little inclined plane, which throws the knob out of its position, so that the hand cannot pass over it on any future revolution after the first contact. This arrangement is rendered necessary to prevent the repetition of letters, on account of the extreme rapidity of the revolving arm and recording apparatus.

Printing Apparatus.

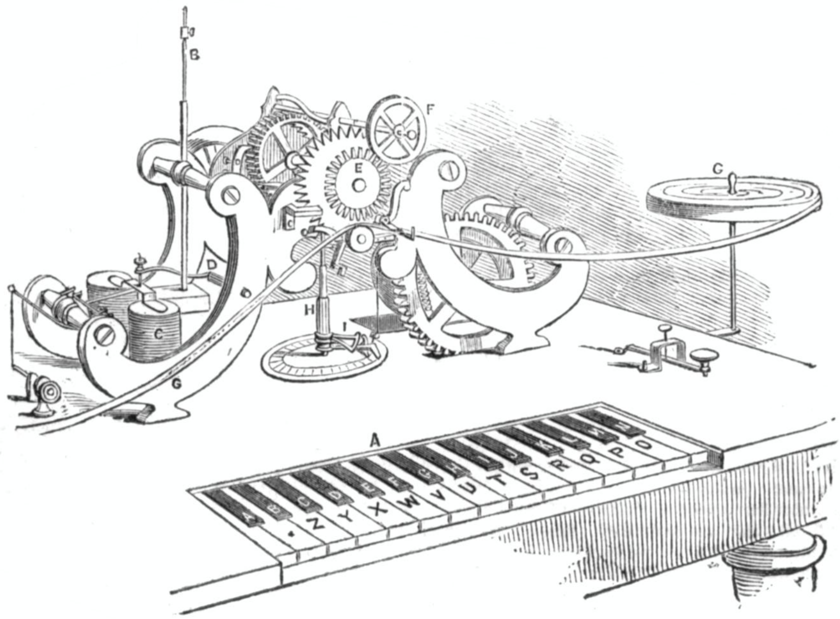
A shaft, which revolves seven times faster than the type-wheel, has a fly-wheel upon it to overcome the inertia of a small shaft which moves the printing press. This shaft is locked to the fly-wheel shaft by means of a clutch, which rests upon a small inclined plane. Whenever this clutch is kept upon the inclined plane, by means of a detent, the fly-wheel shaft revolves independantly of the small printing shaft; but as soon as the detent is moved by the action of the armature of the electro-magnet, the clutch locks both shafts together, and the small shaft is made to revolve one revolution, when the clutch again rests upon the inclined plane, which lifts it off the fly-wheel shaft. A cam is attached to one end of this shaft, which lifts the press and the paper upon which the message is to be printed against the type-wheel. The time of the locking of the shafts depends upon the arrival of the electrical wave, and thus, with two instruments in perfect harmony, the operator has the printing apparatus of the distant instrument as completely under his direction as the one before him. But to correct any minute variation in time between the instruments in circuit, there is a corrector, or wheel, attached to this shaft, with hook-shaped teeth, which mesh into corresponding cavities in the type-wheel. The latter being loose upon the shaft, or only held by friction, is removed backwards or forwards by the corrector to exactly the same position as the type-wheel on the instrument from which the message is being sent. This correction takes place in the act of printing every letter. There is also upon this shaft a cam, so arranged that, the moment the armature falls off the electro-magnet and opens the detent, it forces the detent up, and restores the armature to its original position upon the poles of the magnet.

Another new feature in this instrument, is its power of cutting off at will all offices except the one to which it is desired to communicate. This is accomplished by a flange on the type-wheel—this flange having a space cut out opposite a certain letter, and each office having the flange cut out at different letters from each other. A bolt is made to slide through the space, and moved through by the action of the instrument. If this bolt is sent through at the moment the space is opposite, it permits the instrument to run, if not, it goes against the flange and locks the type-wheel.

The operator, knowing at what letter a certain instrument will be unlocked, touches that key. This allows the instrument he wishes to communicate with to run; and he can send the message to that one, the other offices being unable to get it, as they would be locked, and could not bring their instruments into unison with the one sending the despatch. Thus, it is absolutely secret in its transmission, and, if necessary, anyone could send his own message, as it is only necessary, to insure its safe arrival, to touch the right keys, which are all lettered.

The electrical circuits are extremely simple. The earth-wire connects with the steel pins or knobs on the

keys of the transmitting apparatus, and from the revolving arm through the electro magnet, and thence through the line and distant magnet to the earth. Reversed currents are not necessary, except on long submarine wires. There may be as many instruments in circuit as may be desired. The European news, consisting of about 3,000 words, by the arrival of each Transatlantic steamer, is transmitted by this instrument from Boston to New York, a circuit of about 300 miles, at the rate of 2,000 to 2,500 unabbreviated words an hour. There are 25 stations on the circuit which receive copies of the news, all of which are printed in plain Roman type by the Boston operator, all the instruments receiving the message at the same time, the receiving clerks at each station having simply to hand the copy as it arrives to the party entitled to receive it.



A. Key Board.
B. Vibrating Spring.
C. Electro-Magnet.

D. Detent.
E. Type-Wheel
F. Ink Roller.

G. Paper Printed upon.
H. Revolving Shaft.
I. Revolving Arm or Circuit Closer.

The mode of operating with this instrument is extremely simple, and easily acquired. The office desiring to transmit a message calls the station by touching the keys in a pre-arranged order, the distant office at once returns the signal "O.K.," or all right. The manipulator then commences the message, first striking the zero key to start the distant type-wheel in unison with his own. If the message is received correctly he is allowed to finish, and then the operator at the distant office gives the return signal of all right; if there is a mistake the receiving office touches his key board, which throws extra letters to the transmitting station, and he then commences again from the point where he made a mistake. There can be no mistake, however, if the operator touches the right key, and manipulators become so expert that they seldom touch the wrong one; if they do, the error is shown by the copy of the message on their own instrument, and immediately corrected.

If I have succeeded in conveying a clear and intelligible impression of the principle of the Hughes' system, it may be proper to invite your attention to what appear to me to be natural deductions.

Accuracy is secured by unerring mechanical laws, and not by the skill of the operator, as in the needle or Morse systems. Not only this, but in all other systems, if one of the symbols be missing, another letter is formed by the remaining symbols. *Rapidity* is secured by reducing the labour to its minimum. A single touch of a key prints the letter, instead of three or four vibrations of a needle, or a similar number of motions of a key, as in the formation of symbols to represent letters. Accuracy and rapidity being thus secured, ease and simplicity of manipulation must of necessity follow, and, consequently, the young operator readily acquires his or her education. The instrument, however, is specially adapted to females.

The one-wave system is specially important on long submarine circuits, where electrical impulses are limited, one wave being sufficient for a letter instead of five. Great difficulty has been experienced on long cables by the variation of time in the transit of the wave. By this correct timing instrument, simple and perfect compensation is mechanically attained for any length of wire or extent of variation. The sensitiveness of the magnet also enables this instrument to record more waves upon a long circuit than any I have yet met with. The rapidity of an instrument, however, does not consist only in the fact of its extreme sensitiveness, but also in its power to free itself from the influence of a current so soon as the effect of the current has caused the instrument to record the signal or letter sent. This property, attained by the electrical and mechanical combination of scientific laws, embodied in the design and construction of the instrument, and demonstrated by the results produced, must in time remove all doubt of its superiority, while its English tongue represented in plain printed Roman characters, will tend to make it the favourite of the Anglo-Saxon race.

DISCUSSION.

The Chairman said, in inviting discussion and further inquiry into this interesting subject, he would call the attention of the meeting to one or two points which he thought worthy of observation. The idea of the introduction of this self-curing material was perfectly original, and, as an invention, was very beautiful; but practical men would require it to be put to a very severe

test before they adopted it. He believed it to be quite within the range of possibility to introduce a sufficient quantity of that viscid material into a telegraph cable, to effect the purpose which they had seen illustrated upon a small scale that evening, in a manner that must have been highly satisfactory to all present. If a fracture took place in the gutta percha covering at the bottom of the ocean, the cure would be effected without the fact of the rupture ever being known, as it would immediately heal itself. The novelty of this discovery, and its application to such a purpose, was highly honourable to Professor Hughes. They must take it for granted that this semi-fluid was a good insulator; and, as it had the property of hardening upon coming into contact with the water, it was likely to become a most valuable adjunct to gutta percha, which was of a porous nature, and liable to injury from fractures. He also thought the invention would be very valuable as applied to the street wires of electric telegraphs, and these afforded great facilities for testing its value. The mode adopted by Professor Hughes for obtaining synchronism in his instrument was very beautiful and novel. Previous attempts in this direction, though repeatedly made, had hitherto not succeeded. With regard to the rapidity with which the signals could be recorded, it was stated in the paper, that the Trans-Atlantic intelligence was conveyed between Boston and New York at the rate of from 2000 to 2500 unabreviated words per hour, which was equal to about 40 words per minute. There was a point upon which it would be interesting to have some information. It was stated that any number of instruments could be used in the circuit, and that there was the power of cutting off the communication from all the instruments, except the one which was being addressed. Supposing the instruments at the two extremities of the circuit to be in communication; for a moment the intermediate circuit would be interrupted. Was there any movement which indicated to the clerks at the intermediate instruments, the fact that signals were passing through the entire circuit, and must not be disturbed.

Professor Hughes replied that that was so, and there was no fear of interruption from the intermediate instruments.

Mr. William Smith thought the experiments which Professor Hughes had shown of the restoration of the insulation should be tested under pressure, for, after all, the main question was to ascertain how it would behave under the pressure that was due to the depth of the ocean in which the cable was submerged. This might be done in a closed vessel with a force-pump. He thought there was no difficulty in producing a semi-fluid substance which would become solidified by the action of water; but the question was whether, if they covered the wire with this preparation, and then cut through the gutta percha, the pressure would not force the material through the opening and prevent its acting.

The Rev. Walter Mitchell had had the advantage of seeing this experiment tried in private, where it could be conducted with greater care and accuracy than in a public room, and the results were highly satisfactory.

Mr. Wm. Newton begged to ask whether there was any objection to stating what the nature of this viscid composition was? It would be interesting to the members to know.

Mr. Hyde replied that it would afford him great pleasure to furnish as much information as possible on this subject; but in almost every invention there were certain things which it was expedient to keep to themselves. He would add, with reference to these instruments generally, that there were many things which he might communicate if he could do so in justice to the rights and claims of the inventor. Unfortunately people did not recognise, as he thought they ought to do, the rights of property in inventions, and for that reason inventors were obliged to keep some things to themselves.

Mr. Newton added that Professor Hughes had protected his invention by letters patent; and in his specification he was bound to state, not only in what the invention consisted, but also the means by which he proposed to carry it into effect; and when the specification was enrolled, the inventor must give the full details of it. He would say with regard to this insulation, it had been known for some time in the United States, and he had seen observations in the public prints detracting from its merits. He alluded to that in order to observe that, as far as he could judge, those statements were erroneous, and instead of the invention being valueless, it had been properly designated as an exceedingly ingenious mode of insulating the electric conductor. He agreed with the opinion expressed that it was advisable to make experiments in order to ascertain the manner in which this insulating compound would act under considerable pressure. With regard to the Atlantic cable, he had never had any confidence in it. It appeared to him that any metallic coating on the outside must have some effect upon the conductor inside, especially when the conductor was only protected—as in the case of the Atlantic cable—by an imperfect insulator like gutta percha. Mr. Hyde had stated that gutta percha was a good insulator—a remark which he (Mr. Newton) was surprised to hear from one so well qualified to judge of these matters, because it was generally conceded that gutta percha was only a moderately good insulator. India-rubber was much better than gutta percha, which had the peculiar property of becoming charged with electricity after it had been used as an insulator for any length of time, and was therefore likely to induce leakage. He could mention one or two other modes of insulation which he considered preferable to that of gutta percha, and particularly he would notice the invention of Captains Drayson and Binney of the Royal Engineers. They proposed, instead of a strand of seven wires, to have a single large conductor, and to cover that with a solution of india-rubber paid round with silk or some other non-conducting substance, and to enclose the whole in a vulcanised india-rubber tube which contained a column of air. In a conductor upon that principle they had, in the first place, the insulation of the india-rubber; secondly, the insulation of the silk; thirdly, that of the air, and finally that of the outer india-rubber tube. This appeared to him to form a perfect insulator of the electric wire. There were other insulating compositions which had come under his notice professionally, one of which was that of Mr. Leonard Wray, who proposed to make a composition formed of india-rubber or gutta percha, mixed with siliceous matter, and a resinous substance, such as shell-lac. This appeared to him to contain all the elements of a good insulator. He was not, however, aware that this plan had been tested to any great extent. Another method had been introduced by Mr. Macintosh, but he did not consider it so practical as the others to which he had alluded.

Mr. Hobbs remarked that there was novelty in the idea of the material being forced out by the pressure of the water, as stated by some of the speakers. If there was a hole through the gutta percha, he apprehended the pressure on the hole would be the same as the pressure on any portion of the cable, and he could not conceive how, under such circumstances the semi-fluid matter was to be forced out.

Mr. Newton would add with reference to the remarks of the chairman, that this plan would be applicable to underground telegraph wires—that it appeared to him (Mr. Newton), to require the action of water to solidify the viscid fluid, and, as far as he understood, it would not harden by simple exposure to the air.

The Chairman replied that a simple wound in the gutta percha covering would not be injurious to insulation in a land telegraph wire. The injurious effect would only take place in the event of water getting into the pipe. The moment the wound in the gutta percha rendered

the insulation imperfect, the water would have the effect of healing the wound by its action on the viscid fluid.

Mr. THOMAS WINKWORTH would take the liberty of asking one or two questions. Should any fractures occur in the cable, what provision was made for the fresh supply of the semi-viscid fluid which exuded or oozed out?

The CHAIRMAN.—When it is exhausted you cannot put in a fresh supply.

PROFESSOR HUGHES explained that there would be no more fluid exuded than was sufficient to fill up the space which was cut out. If they cut the gutta percha in the open air, no more fluid would ooze out than would be enough to fill the space, and therefore the quantity in the tube would be sufficient to fill up an innumerable number of small fractures.

The CHAIRMAN—Does the fluid harden by exposure to the air?

PROFESSOR HUGHES—No; but it could be easily made to do so.

The CHAIRMAN was still of opinion that it would be valuable as applied to land telegraph communication. He would inquire whether the application of the semi-fluid matter was very expensive?

Professor HUGHES replied that the cost was something below that of gutta percha. It could be placed within two coatings, or between the wire and the single outer coating.

Mr. HOBBS would ask what effect time would have upon this material? The substance might be very good when first applied, but in time its properties might be destroyed.

Mr. HYDE replied that time must answer that question. He was not able to do so at present.

Professor HUGHES said it had been tried under water for three months, and had been exposed to the atmosphere for six months, without any change whatever having taken place. It was not injured by the action of the atmosphere.

Mr. WINKWORTH would further inquire whether the printing instrument was in practical use for any great length of land wire, and on what length of circuits it had been worked?

Professor HUGHES said it was in practical use in the United States on six telegraphic lines when he left America, and that it had been worked over a circuit of 600 miles without relay. The right to use the instrument had been purchased by companies possessing 30,000 miles of telegraph in America.

Mr. WINKWORTH would like to be informed whether the instrument had been tried upon submarine wires; and if so to what extent in length, and with what rapidity?

Professor HUGHES said it had been worked upon the Atlantic cable while coiled at Keyham, and also upon the Red Sea and Australian cables, through their entire length.

The CHAIRMAN inquired whether those experiments had taken place in the presence of witnesses.

Professor HUGHES said they were witnessed by several persons.

The CHAIRMAN added that it was satisfactory that Professor Hughes was able to state that the experiments were witnessed by several persons, as he was not aware that that fact had ever before been published. It was gratifying to know that messages were passed through the entire distance.

Mr. HYDE stated that the experiments were continued for several weeks during the shipping of the Atlantic cable at Keyham in May last. The transmission of messages through the Atlantic cable was at that time slow, and at a much less rate than the instrument would be capable of accomplishing at the present time. Professor Hughes had made no experiments upon long submarine lines until he came to this country, and the first experiments were made upon the Atlantic cable. The instruments were timing instruments, and the rate of speed must be proportioned to the rate at which the electric wave would travel through the wire. When he was in America, he learnt from the electrician's report to the Company that the rate at which the eletric wave would travel through the Atlantic cable was equal to four words per minute with the ordinary Morse relay. The instrument of Professor Hughes, intended for land lines, would not move correctly at this slow rate, and therefore instruments were specially made with a minimum rate of speed of four words per minute, in accordance with the electrician's report. When Professor Hughes arrived at Keyham, he found that the rate at which signals could be transmitted through the Atlantic cable was less than had been stated in the report, and the instrument was not adapted to so slow a motion. After reducing it by temporary arrangements, he was able to transmit letters at the rate of two and a half words per minute. This was done in the presence of Mr. Field, the managing director, and some half-dozen other persons. Since that time the instrument had been tried upon the Tasmanian cable, 240 miles in length, and through that they worked 25 words per minute. Subsequently, experiments were made upon the Red Sea cable, 1780 nautical miles in length, or nearly 2000 statute miles. Upon that cable they worked with perfect success, day after day, for a week, first upon 500 miles, then upon 800, then upon 1500, and finally upon the whole length of 2,000 miles. The rate of speed through the entire length was between four and six words per minute. The rate over 1000 miles was from eight to ten words per minute; through 500 miles it was twenty words per minute. With reference to the semi-fluid substance, he had no desire to keep back any useful information, but they had been trying experiments for four months, in order to ascertain what combination of materials was best adapted for the purpose. Mr. Newton had referred to a cable constructed with a long tube filled with air as a non-conducting element. It appeared to him (Mr. Hyde) that as an insulator the air would be far inferior to the fluid substance, or even to gutta percha. He also thought that if any fracture occurred in the coating, the pressure upon it would be such that the air would be displaced by the water. On the other hand, Professor Hughes had been seeking and had obtained a semi-fluid substance, every portion of the ingredients of which would be heavier than water. He would say with reference to the semi-fluid substance, that almost anything would make a semi-fluid substance. The question was—what was the best material, and this he did not feel disposed at present to develop. He would only say that ordinary oil or hydro carbons mixed with resinous substances would produce such a semi-fluid substance as would restore insulation. The merit of the invention consisted in the idea of the use of a semi-fluid material for this purpose and not so much in the material used. Mr. Smith had suggested that means should be taken to test the action of this material under heavy pressure. His (Mr. Hyde's) impression always had been that the pressure would be equal upon all parts of a submerged cable, and therefore the fluid would be in the same position under a pressure of two miles depth of water as under two feet in a bath. They had, however, gone almost to the extent proposed by Mr. Smith. They had made the experiment with a pressure equal to that of 3,000 fathoms, or two miles, with perfect success, with the gutta percha incised before it was submerged. In one case the gutta percha was split from end to end and it came out perfect.

Mr. BEVAN referred to the recent experiments upon insulation made at the works of Messrs. Silver and Co., at North Woolwich. As far as he understood it, the insulation was effected by india-rubber, and if a puncture occurred in the tube it would by the pressure be healed. Some credit was therefore due to the plan as being prior to that of Professor Hughes.

Mr. Newton said experiments as to the effect of pressure had been tried with the cable as designed by Capt. Drayson, and it was found that with a pressure exceeding that of two miles below the surface, a puncture being made in the tube, the air was not expelled from it. In the case of a small fracture, such as a crack, it did not appear that the air escaped even when under hydraulic pressure.

Mr. Hyde was very glad to hear it; he thanked Mr. Newton for having mentioned the different modes of insulation that had come under his notice. He (Mr. Hyde), however, was not there for the purpose of criticising the inventions of others, but to illustrate and defend those of Professor Hughes.

Mr. Smith said the question was, whether the material would exude from the tube, when cut whilst under pressure; he knew that in some experiments that were tried the fluid did exude. The cut was made whilst under pressure, and there was no balancing of the forces until some of the fluid had exuded, and some alteration in the dimensions had taken place.

Mr. Tuckett submitted that upon the principle of hydraulic pressure if the surface of the whole tube were greater than the surface which was not protected, the pressure being in proportion to the area, there must be exudation, and there would be a tendency to press the liquid out of the hole.

Mr. J. G. Appold, F.R.S., said, experiments showed that there was no exudation. It made no difference whether it was under pressure or otherwise.

Mr. Hyde, to meet the hydraulic point that had been raised, would ask whether the pressure upon each point would not be the same? To get the fluid to ooze out, they must have a point free from pressure. The pressure was equal on all parts of the cable.

The Chairman said, this point had been proved by experiment.

Professor Hughes remarked that the fluid, being heavier than water, was not displaced by the water.

The Chairman would wind up this discussion with a few observations, one being not so much applicable to telegraphic communication as to the objects and action of this society. When he first joined the Society, about 24 years ago, before the revolution in its operations took place—for it was more than a reformation—no patent scheme could be brought before the society. It must have been an invention thrown open to the world. The revolution to which he had alluded, brought about a great change in this respect; and he thought one of the greatest boons the society now conferred, was the encouragement it gave to patentees to come with their inventions as soon as they were in a condition to do so, and allow them, as had been done by Professor Hughes and Mr. Hyde that night, to give them such information as they could, without injury to their interests. Mr. Newton had a perfect right to ask for the information he was desirous to obtain; but, at the same time, there was no improper selfishness in Mr. Hyde refusing to communicate it; he had a perfect right, if he chose, to keep the secret to himself. The application of india-rubber for the purpose of insulation was not new, it had been used in single, double, and treble coats for the last 20 years. The great improvement consisted in thoroughly uniting the edges of the india-rubber by means which would not injure it in its non-conducting character, or lead to the ultimate decomposition of the material itself. The solutions formerly employed for the purpose were injurious to it; and he was happy to say there were two or three plans then under consideration which gave good promise of success. These, however, had nothing to do with the beautiful idea of placing within the gutta percha a material capable of healing those wounds which arose from the defects existing more or less in all impure gutta percha — such as air bubbles, small particles of fibres, or wood, or indeed from any defect whatever. He was sure he was only expressing the feelings of the meeting in proposing a vote of thanks to Mr. Hyde for the paper he had read, and also to Professor Hughes for the illustrations he had given of his beautiful apparatus, and the explanations he had afforded upon this very interesting subject.

A vote of thanks was then passed to Mr. Hyde and Professor Hughes.

The Secretary announced that on Wednesday next, the 20th instant, there would be NO MEETING of the Society, and that on Wednesday, the 27th instant, a Paper by Mr. John Arthur Phillips, "On the Metallurgy of Lead," would be read.

Home Correspondence.

SOCIETY OF ARTS' EXAMINATIONS.

Sir,—If the Examinations of the Society of Arts are ever to become a great fact, extending from year to year in efficiency as a practical stimulus to the educational efforts of the great bulk of the community, and proving its value by the extent of its operations, they must be placed upon a basis more systematic than at present appears to be the case. It is true that numerous Local Boards have been formed, that numbers of candidates for prizes and certificates have shown their appreciation of the advantages offered to them, and that really substantial benefits have accrued to many, who, without this aid, might never have had the means of raising themselves. But, yet for all this, it can be shown that in localities where it might have been supposed a knowledge of such opportunities being open to our young men would have been generally diffused, little is comparatively known, and that by far the greatest amount of the exertions used are practically thrown away.

Much of this is no doubt owing to the want of sufficient publicity, to the difficulty of bringing home the beneficial nature of the Examinations to the minds of the great majority, and the want of information as to the means of taking advantage of them. Something also is owing to the want of a permanent character to the Local Boards, and that absence of unity of purpose and action which is so indispensable to success. Instead of each Institution in association with the Society of Arts being permitted to form a Board of Examiners, irrespective of others, it would, I believe, be advisable for a permanent Board to be formed in every principal town throughout the kingdom, to be specially recognised by the central body in London, and to be a source for information and guidance to every one within reach of its influence. It is one of the evils attaching to the rejection of the personal attendance of Examiners from London that too much is left for local effort, and though any more direct supervision might interfere with independence of action, it would at least conduce to more practical efficiency. Without, however, reverting to previous decisions which may be left to some future opportunity, it may be worthy of consideration whether a change in the form of appointing Local Boards of Examiners might not be adopted with advantage.

Another important point for consideration is the preparation of candidates for Examination, and this more immediately concerns the managers of Mechanics' Institutes. Wherever the duties of a managing committee are well performed they prove successful, but unfortunately too many deem the performance of the duties irksome, and leave all to the secretary, who, whatever may be his zeal and ability, is rarely equal to the whole task imposed on him, and who, perhaps, in the majority of cases, leaves much undone, and the Institute is comparatively a failure, the public lamenting that there should be so little desire for mental improvement.

To remedy this state of things, it is, in the first place, indispensable that those who undertake the duties of a managing committee should resolutely set about the fulfilment of them. They should not be cast down by discouragements, nor relax their exertions by apparent failures; no feeling of despondency should be admitted, but, with a cheerful and hopeful spirit, they should persevere, and always be buoyed by the conviction that success is certain if the means be diligently employed. Their reward will be in the improvement of the community in which they dwell, in the moral and social welfare of their neighbours and dependents, and the consciousness of duty well performed. Their labours will not always be appreciated, nor their offers of aid responded to, but this should be an inducement to increase their exertions, for where the desire for knowledge is the least, the necessity for it is the greatest.

In most Mechanics' Institutes the major part of the instruction imparted is of an elementary character, and such classes furnish no candidates for the Examinations of the Society of Arts; but they require a similar aid, and this might be afforded by periodical examinations and the award of small prizes for proficiency. Such classes prove valuable as preparatory to the more important ones, and where the pupils have shown, by the examinations, their knowledge of the elements of instruction, their labours should be directed to specific branches, with especial reference to their becoming candidates for the certificates of the Society of Arts. To render this, however, more appreciable, it would be as well if the plan of the examinations, the subjects selected, the certificates awarded on previous occasions, the substantial advantages obtained by successful candidates (of which there are numerous instances), and the mode of procedure, were printed on a sheet, and conspicuously exhibited in the reading-room and class-rooms of every Mechanics' Institute in the Kingdom, whether associated with the Society of Arts or not.

In this county the Institutes have the advantage of the Yorkshire Union, which omits no opportunity of disseminating information on every subject of interest to them, but the majority of other Institutes possess no such efficient organisation. They are left therefore to individual effort, which, however well intentioned, is not always the most efficacious, and the consequence is that praiseworthy labours fail in their effect, and a scheme which is capable of proving a mighty engine in the elevation of the great majority of our population, performs but a small portion of its work. Every article for sale, whether a quack medicine or blacking, has been extensively and continually advertised before it has come into general consumption, and though education may assume a higher ground, it yet requires publicity and its advantages to be made known with continuous exertion.

In a letter which appeared in a former number of the *Journal*, Mr. Buckmaster, who has done good service in the cause of education, advocates the more general adoption of free circulating libraries as a means of promoting the dissemination of knowledge. I believe it would have a contrary effect. It is a common practice to value an article by the cost of it, and those who could obtain books gratuitously would value them accordingly. The majority of readers would be those who now either purchase cheap books or subscribe to circulating libraries; and I believe few, if any, would be tempted to read, from the mere fact that they could do so without paying for it. Again, many Institutes are indebted to their libraries for the means of continuing their educational efforts. Without the aid of the subscriptions of those who use only the library and reading-room they would be unable to continue their classes for instruction, and I might cite Sheffield as a case in point, where the establishment of a free library has helped, with the local rating of the Institute, to cause almost, if not quite, its extinction. Class fees are usually found insufficient for inevitable expenses, and wherever an Institution has been made self-supporting it is principally owing to the subscriptions obtained from those who use the library.—I am, &c.,

BARNETT BLAKE.

Leeds, 29th March, 1859.

PRODUCTS OF THE COMBUSTION OF COAL GAS.

Sir,—I am sorry to trouble you with another letter on this subject, but I promise you it is my last; and I feel that an apology is necessary, not only because the matter has been already fully discussed, but because the letter of your correspondent, Mr. Evans, in the last number of the *Journal*, is so singularly inconsistent and illogical that it really does not require an answer.

Mr. Evans is a gas manufacturer, and he assures you that it is the wish of all gas companies to discover a means of abstracting the sulphur which remains in the purified gas; and he adds that I should be doing a service if, as a chemist, I could devise some plan for effecting it. Now I regard this as a full admission that the sulphur of gas is known to be objectionable, and yet Mr. Evans does not know how it can be injurious; for, in spite of well-known chemical laws, he has not yet succeeded in getting a drop of oil of vitriol from the sulphur of burning gas, notwithstanding that he has tried every possible way for the last five years. Let me add to this his admission that, in order to ascertain roughly the amount of sulphur compounds in coal gas, we must use ammonia to fix the sulphurous acid, and chemists will see the dilemma in which Mr. Evans is placed.

But, apart from all criticism, there is a simple means whereby Mr. Evans may test his conclusions. If he will burn gas in the ordinary way from an argand burner, under a large glass vessel containing water, he will see the acid in the outside of the vessel, and will soon obtain enough oil of vitriol to satisfy every doubt, notwithstanding that the acid thus collected is but a fraction of that which is ultimately formed.

As to Mr. Evans' comments on my expression *raw* gas, they are in no way connected with the matter at issue—although I might say that the term is perfectly applicable to gas that has not been purified by other means than the condenser, for it was in this sense I used it; and as for the numbers, they are not mine, but Mr. Wright's. I am, &c.,

H. LETHEBY.

London Hospital, April 8th, 1859.

MR. VARLEY'S PAPER ON THE ELECTRIC TELEGRAPH.

Sir,—In the *Journal of the Society of Arts* dated April 1st, in the discussion on a paper on submarine telegraphy, I find it stated by Mr. Cromwell Varley, that without Professor Thompson's Reflecting Galvanometer, the Atlantic cable would never have transmitted a single message. The fact is, however, that the whole of the signals sent from the "Agamemnon" to the "Niagara," and from Valentia to Newfoundland, were received and indicated by a galvanometer made by me for the Atlantic Telegraph Company; a simple, single needle, made very delicate, and exceedingly sensitive, but not possessing the almost microscopic proportions of the beautiful instrument of Professor Thompson. I have more than one competent authority for this statement, but it is only necessary to mention the name of Mr. Charles Victor De Sauty, Chief Electrical Superintendant at Newfoundland, and whose words I have permission to quote. They were in substance as follows:— "If it will be of any use or satisfaction to you, I beg to inform you that one of your galvanometers was used all through the laying down of the cable, and was the only instrument upon which we received messsages and signals at Newfoundland, and you have my full consent to use my name as an authority."

My objects in asking you to publish this communication are, in the first place, to show Mr. Varley his error,

and to give a fair estimate of the capabilities of the cable while it remained intact; and in the second place, in justice to myself as a manufacturer of telegraph instruments in general, and of that galvanometer in particular. It may be as well also to state that I received the information from Mr. De Sauty in the beginning of March, and it was merely intended as a testimonial of good workmanship. The galvanometer in question is now the property of Mr. de Sauty, having been presented to that gentleman by the directors, as a momento of the event.

I am, &c.,

HENRY MOORE.

Spa-house, Lloyd's-row, Clerkenwell.

THE ROCKET GUN.

Sir,—The great attention now very properly directed towards the improvement of projectiles seems to have left the cannon completely in the rear; in fact, no ordnance is capable of throwing the enormous shot now proposed to be used without destruction at the first discharge; and it is evidently desirable to throw still larger than any now proposed—if cannon could be found to withstand the terrible concussion. Such being the fact, it would appear that we have hitherto been making a great mistake, and, instead of propelling the shot from the cannon, we should project the cannon from the shot. With the view of solving this enigma, I have made some very successful experiments with a "Rocket Gun," upon which a new system of artillery may be founded, far more economical than any now in use, and infinitely more destructive. It combines the utmost rapidity of firing, with perfect safety to the gunners, without the miserable expedient of breech-loading, and is equally adapted to the musket bore, the ten-inch gun, or twice that diameter, if such should be required.

A ten-inch "Rocket Gun" consists principally of a core or cylindrical pin of cast iron—say, about six feet long, connected at the base with a large mass of metal, mounted on trunnions, as usual. The projectile, in shape, resembles the iron case of a Congreve rocket, and is cast with a ten-inch bore, so as to slide easily on the pin. That bore is charged and wadded with the proper weight of powder, and the pointed head may either be solid, of any weight, or cast with an additional conical chamber and fuse-hole, to receive a bursting charge of powder, liquid fire, or any other combustible of still more destructive power. For siege use no boring will be necessary, but when accuracy of aim may be required, the pin must be turned—an operation of no difficulty whatever—and the short tail of the projectile slightly cleaned out after casting, in order to ensure a tolerable fit. Rifling, as in the Lancaster gun, or by common grooving, may also be introduced; but the terrible shower of projectiles which a single "Rocket Gun" is capable of throwing, will render that operation quite unnecessary.

Rapidity of fire is, of course, obtained, because every projectile carries its own charge and touch-hole, while the gunner has only to slip it on to the pin by hand, or with a crane, if of large size, to prime and fire.

I shall be happy to exhibit the operation and effects of a musket-bore "Rocket Gun" to any one interested in such matters.

HENRY W. REVELEY.

Poole, Dorset, March 26.

Proceedings of Institutions.

London Mechanics' Institution.—The following letter has been received by Mr. T. J. Pearsall from Lord Brougham:—"Sir,—I have received your letter, stating that a meeting is to be held on behalf of the London Mechanics' Institution, and I need hardly assure you how convinced I am of the importance of this proceeding. The greatest misapprehensions have prevailed respecting the history of that Institution; and its inestimable services to the improvement of the working classes have been of late years overlooked, or undervalued, as well as the benefits which its continued exertions are still capable of bestowing. It is therefore to be hoped that the difficulties under which it at present labours may be removed by the contemplated proceeding. I lament exceedingly that I can do little more than give my good wishes to this good work, but my means are very limited, and the demands upon them have no limit whatever. Such a meeting as you announce can never be held without bearing in grateful remembrance the founder of the Institution; and they who question Dr. Birkbeck's claims to this great distinction, have only been able to state that others had some months before broached the idea of such a plan. But 20 or 30 years before, he had laid the foundation of all that has since been done by delivering a course of lectures to working men, so that the great step must be regarded as having been made by him at the beginning of the century, and not in 1823, when he both founded and endowed the London Institution."

MEETINGS FOR THE ENSUING WEEK.

Mon. ......London Inst., 7. Mr. John Ella, "On Chamber, Orchestral, and Ballet Music."
Medical, 8.

Tues. ......Syro-Egyptian, 7½. Anniversary.
Civil Engineers, 8. Mr. W. J. Kingsbury, "Description of the Entrance and Entrance Lock of the Victoria (London) Docks, with a detailed Account of the Wrought-iron Gates and Caisson, and Remarks upon the Forms adopted in their construction."
Statistical, 8. Mr. Danson, "On a Method of Relieving the Density of Town Populations."
Pathologcal, 8.

Wed. ......Royal Soc. Literature, 4. Anniversary.
London Inst., 7. Conversazione.
Geological, 8½. 1. Prof. Owen, "On some Reptilian Remains from South Africa." 2. Mr. E. Hull, "On the South-Easterly Thinning-out of the Lower Secondary Rocks of England."
Ethnological, 8½.

Thurs .....Linnæan, 8. 1. Dr. Griffith. "On *Gnetaceæ*." 2. Dr. Seemann, "Synopsis of *Camellia* and *Thea*."
Chemical, 8. 1. Dr. Roscoe, "On the Absorption by Water of Chlorhydric Acid and Ammonia." 2. Dr. Debus "On Polyatomic Alcohols."

Sat. ......Royal Botanic, 3¾.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. No.

Delivered on 9th March, 1859.

4. Bill—Affidavits by Commission, &c.
French Emigration Scheme—Correspondence.

Delivered on 10th March, 1859.

50. Local Acts (38, Ipswich (Borough) Fishery); 39, North and South London Junction Railways—Admiralty Reports.
80. Harbours, &c., Bills (14, Mersey Dock and Harbour)—Board of Trade Report.
102. Education Grants (Scotland)—Returns.
104. Portpatrick and Donaghadee Harbour—Return.
Harbour of Refuge—Report of the Commissioners.
British Columbia—Papers, Part I.

Delivered on 11th March, 1859.

4. (1.) Church Rates—Supplemental Return (a Corrected Copy).
6. Railway and Canal Bills (140, Warrington and Stockport Railway)—Board of Trade Report.
106. Court for Divorce and Matrimonial Causes—Return.
113. Houses, &c.—Return.
118. Poor Rates—Return.
119. Fishery, Piers, and Harbours (Ireland)—Return.
63. Bills—Highways (amended).
65. ,, Poor Relief (Ireland) Acts Amendment.
66. ,, Combination of Workmen.
69. ,, Oaths Act Amendment.

Delivered on 12th and 14th March, 1859.

19. Lunatics—Return.
61. Works and Public Buildings—Abstract Accounts.
110. East India (Oude Proclamation)—Return.
112. Population, &c., of Parishes—Return.
120. Enfield Establishment—Return.

70. Bills—Municipal Elections (as Amended in Committee and on Re-commitment).
71. Bills—Law of Property and Trustees Relief Amendment (amended).
60. Bills—Public Offices Extension.
61. „ Court of Probate, &c. (Acquisition of Site).
67. „ Law Ascertainment.
68. „ Registration of Births, &c. (Ireland).
Poor Relief (Scotland)—13th Report of the Board of Supervision.

Delivered on March 15th, 1859.

6. Railway and Canal Bills (141. London Bridge and Charing Cross Railway; 42. Londonderry and Lough Swilley Railways; 143. Llyfni Vale Railway; 144. South Yorkshire Railway and River Dun Company; 145. Waveney Valley Railway; 146. West London Railway)—Board of Trade Reports.
50. Local Acts (40. Tyne Improvement; 41. Wear Navigation and Sunderland Docks; 42. Londonderry Bridge; 43. King's Lynn Borough and Port and Harbour Improvement)—Admiralty Report.
72. Bill—Eaton and Welton Exchange.

Delivered on 16th March, 1859.

6. Railway and Canal Bills (147. Lancashire and Yorkshire and East Lancashire Railway Companies)—Board of Trade Report.
80. Harbour, &c., Bills (15. Thames Watermen and Lightermen)—Board of Trade Report.
126. British Museum—Return.
129. Chelsea New Bridge—Return.
73. Bill—Saint James Baldersley Marriages Validity.
Church Estates Commissioners—8th General Report.
Ecclesiastical Commissioners for England—11th General Report.

Delivered on 17th March, 1859.

117. Hops, &c.—Returns.
128. Revenue Departments—Estimates.
130. Tonnage and Pilots (London)—Returns.
137. Seamen Deserted—Returns.

Delivered on 18th March, 1859.

6. Railway and Canal Bills (148. Londonderry Bridge)—Board of Trade Report.
121. Population, &c.—Return.
122. Woods and Forests, &c.—Return.
123. Property and Income Tax—Return.
126. (1.) British Museum—Plan referred to in No. 126.
134. Army (General Officers)—Return.
135. Chaplains, &c. (Army)—Return.
136. Foreign Office—Copy of the Report of Mr. John Phipps.

Delivered on 19th and 21st March.

116. Coal—Copy of the Report of Messrs. Miller and Taplin.
121. Population, &c —Return (a corrected copy).
124. Duchy of Lancaster—Account.
132. East India (Governor General)—Copy of a Despatch.
50. Local Acts (44, Kingston-upon-Hull Docks)—Admiralty Report.
139. Malt—Account.
144. Immigrants and Liberated Africans—Return.
75. Bills—Municipal Elections (as amended in Committee on re-commitment and on consideration of Bill, as amended).
76. „ Ecclesiastical Courts and Registries (Ireland.)
77. „ Elections, &c. (amended).
78. „ Nottingham Charities.
79. „ Galway Harbour and Port Act (1853) Amendment (Ireland).
80. „ Savings Banks (Ireland) Act Continuance.

Delivered on 22nd March, 1869.

125. East India (Mr. Hudson, &c.)—Correspondence, &c.
131. East India (Mortality at Dumdum)—Reports and Correspondence.
138. Postal, &c., Communication (England and Ireland)—Returns.
140. Electors—Return.
141. Constituencies—Return.
145. Registered Electors (Marylebone)—Return.
74. Bills—Tramways (Ireland) (amended).
81. „ Admiralty Court.
82. „ Charitable Uses.
85. „ Petitions of Right (amended).
Ordnance Survey, &c.—Report of the Progress thereof.

Delivered on 23rd March, 1859.

50. Local Acts (38, Ipswich (Borough) Fishery)—Admiralty Report (a corrected copy).
100. Public Income and Expenditure—Returns.
146. British Columbia—Returns.
83. Bills—Parliamentary Voters (Ireland).
87. „ Patents for Inventions (Munitions of War).
88. „ Lunacy Regulation Act (1853) Amendment.
89. „ Common Rights, &c. (War Department).

Delivered on 24th March, 1859.

107. Galway Harbour—Copy of Report.
149. War Department—Return.
84. Bills—Sale of Poisons (amended).
90. „ Debtor and Creditor.

Delivered on 25th March, 1859.

50. Local Acts (45, Greenwich and South Eastern Docks) Admiralty Report.
150. Deserted Children (Ireland)—Return.
153. Population, &c.—Return.
155. Queen Anne's Bounty—Account.
93. Bill—Titles to Land (Scotland).

Delivered on 26th and 28th March, 1859.

68. (2) Trade and Navigation Accounts (February 28, 1859).
151. Deserted Children (Ireland)—Return.
92. East India (Railways)—Return.
142. Chronometers—Return.
163. Committee of Selection—3rd Report.
140. Electors—Return (a corrected copy).
Manning the Navy—Report of the Commissioners and Minutes of Evidence.

Delivered on 29th March, 1859.

50. Local Acts (46, Lymington Railway; 47, Thames Waterman and Lightermen)—Admiralty Reports.
147. Lunatic Asylums (Ireland)—Copy of a Letter.
148. National Education (Ireland)—Returns.
154. East India (Native Worship, &c.)—Copy of Despatch.
159. Population, Revenue, &c.—Return.

Delivered on 30th March, 1859.

152. Highland Roads and Bridges—45th Report of Commissioners.
156. Universities (Scotland)—Copies of Two Ordinances.
161. Landed Estates Court (Ireland)—Return.
92. Bill—Weights and Measures Act Amendment.

Delivered on 31st March, 1859.

158. Militia—Return.
86. Bills—County Prisons (Ireland) (amended).
91. „ Poor Law and Medical Charities (Ireland).

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, April* 8, 1859.]

Dated 1st March, 1859.

536. E. J. Hughes, 123, Chancery-lane—Imp. in preserving animal food, poultry, game, fish, fruit, and other similar substances. (A com.)

Dated 12th March, 1859.

634. J. Palmer, Sutton Coldfield, Warwickshire—A new or improved trap for catching animals. birds, and fishes.

Dated 16th March, 1859.

660. I. Ash, 17, Great Bridport-street, Blandford-square, Middlesex—Imp. in the construction of locks and latches.
664. W. Avery, Birmingham—Imp. in machinery for the manufacture of screws.
668. J. Clark, Newton Heath, near Manchester—Imp. in the manufacture of fabrics in which compounds containing india rubber are used.
670. H. Bessemer, Queen-street-place, New Cannon-street—Imp. in the manufacture of crank axles.

Dated 17th March, 1859.

672. C. Defries, Houndsditch—Imp. in lamps.
674. J. H. Johnson, 47, Lincoln's-inn-fields—Imp. in machinery or apparatus for folding and stiching sheets of paper. (A com.)
678. A. G. Hutchinson, West Derby, Lancashire—Imp. for counteracting damp in buildings.

Dated 18th March, 1859.

684. W. B. Taylor, Ballymena, Antrim, Ireland—Certain imp. in or applicable to looms for weaving.
690. R. Mushet, Coleford, Gloucestershire—A new or improved metallic alloy.
692. A. L. Thirion, Asche en Refail, province de Namur, Belgium—Imp. in water, wind, steam, and hand mills.
694. J. W. Duncan, Grove-end-road, St. John's-wood, and J. E. A. Gwynne, Hanover-terrace, Regent's-park—Imp. in, or connected with, apparatus for the generation, application, and condensation of steam, part of which apparatus or arrangements is applicable to other purposes.

Dated 19th March, 1859.

696. W. B. Gingell, 37, Corn-street, Bristol—Imp. in the form of metal bars used for the stiles, rails, heads, and sills of window sashes, casements, and other lights.
698. S. Stein, Chapel-place, Poultry—Manufacturing a resinous carton or pasteboard from vegetable matter, an imp. for roofing, ship sheathing, lining walls to prevent dampness, and other uses. (A com.)
702. J. Howden, and A. Morton, Glasgow—Imp. in apparatus for obtaining and regulating motive power.
704. W. and S. Pickstone, Radcliff bridge, near Manchester—An imp. in stiffening, sizing, filling, or weighting textile fabrics.
706. W. C. Cambridge, Bristol—An improved construction of chain harrow.

Dated 21st March, 1859.

708. A. Baucq, Marchiennes, France—Maintaining graters mechanically.
710. R. Whittaker, Lennox Mill, Stirling, N.B.—Imp. in the manufacture or construction of metallic rollers or cylinders and mandrills for printing.
712. J. Roberts, Staley-bridge, Chester—Imp. in packing for pistons.
714. J. Bickerton, Oldham—Imp. in opening and securing window sashes.
716. W. Warne, J. A. Fanshawe, J. A. Jaques, and T. Galpin Tottenham, Middlesex—An improved compound or preparation of materials for, and mode of covering and insulating wires or conductors used for telegraphic or electrical purposes.

Dated 22nd March, 1859.

718. G. P. A. Lutz, Rue Ménars, Paris—An imp. in veils.
720. P. Tagliacozzo, 27, Broad-street-buildings—An imp. on metallic pens.
724. J. T. Pitman, 67, Gracechurch-street—Imp. in springs for railroad cars, and for other purposes. (A com.)
726. S. Newington, M.D., Ridgway, Ticehurst, Sussex—Imp. in apparatus for distributing seeds and manure.
728. W. P. Wilkins, Ipswich—Imp. in the arrangements of valves, and in their application to steam engines.
732. J. Tyssen, Rotterdam—An improved apparatus for indicating the speed of ships and other vessels.

Dated 23rd March, 1859.

735. S. Oram, 137, Fleet-street—Imp. in pipes or tubes for generating and superheating steam.
736. W. Adamson, Newcastle-on-Tyne—Imp. in apparatus for propelling vessels.
737. S. Clarke, Albany-street, Regent's-park—Imp. in the manufacture of candles.
738. W. Middleship, Grove-terrace, South-grove, Mile-end—Imp. in propelling vessels.
739. J. Evans, King's Langley, Hertfordshire—Imp. in the manufacture of paper.
741. J. V. Hielakker, Brussels—Improved apparatus for pressing or moulding artificial or patent fuel, fire-bricks, and similar articles.
742. G. Neal, Great Charles-street, Birmingham—Certain imp. in apparatus or fittings connected with the burning of gas for regulating and economising its consumption.
743. W. Delany, Norfolk-street, Strand—Imp. in ploughs for tilling land. (A com.)
744. J. H. Johnson, 47, Lincoln's-inn-fields—Imp. in machinery or apparatus for the manufacture of sheet tin. (A com.)
745. P. P. Boll and H. Reger, Cologne—Imp. in steam boiler and other furnaces. (A com.)
746. F. Tillett, Banner-street, St. Luke's, Middlesex—Imp. in machinery for cutting splints for matches.

Dated 24th March, 1859.

747. W. Garforth and J. Garforth, Dukinfield, Chester—A certain imp. in metallic pistons.
748. W. E. Wiley, 34, Great Hampton-street, Birmingham—Imp. in the manufacture of boxes or cases used for holding needles, pens, matches, pencils, and for other like purposes.
749. W. E. Wiley, 34, Great Hampton-street, Birmingham—New and improved instruments to be used in burning and supporting candles.
750. F. E. Sharp, 3, Gloucester-terrace, Blackheath—Imp. in machinery for corking bottles.
751. E. S. Tebbutt—Imp. in the manufacture of elastic fabrics.
752. C. Sanderson, Sheffield—Imp. in preparing, tempering, and covering or coating thin strips or sheets of steel.
753. W. Clark, 53, Chancery-lane—A machine for separating oats from their husks or chaff. (A com.)

Dated 25th March, 1859.

754. H. Rigby, Salford—Imp. in machinery or apparatus for obtaining motive power, applicable to hoists, and all other purposes to which motive power can be applied.
755. C. Cowper, 20, Southampton-buildings, Chancery-lane—Imp. in telegraphic cables. (A com.)
756. R. Baker, Liverpool—Imp. in chronometers, watches, and other time-keepers."
757. J. H. Johnson, 47, Lincoln's in-fields.—Imp. in fire-arms. (A com.)
758. W. E. Newton, 66, Chancery-lane—Imp. in ovens for baking bread, and other substances. (A com.)
759. C. Hill, Chippenham station, Great Western Railway—Imp. in the permanent way of railways.
760. H. Humphreys, senr., Buckingham—An imp. in unhairing hides and skins, and in the manufacture of leather.

Dated 26th March, 1859.

761. G. Hasletine, 37, King-street—Imp. in the manufacture of small metallic chains. (A com.)
763. E. Steane, Manor-rise, Brixton—An improved means or apparatus for preventing candles dropping or guttering.
765. M. Firth, Sheffield—Imp. in machinery for grinding saws and flat plates of steel. (A com.)
766. Lieut. G. Naylor, R.M., 7, Durnford-street, East Stonehouse—An apparatus for measuring and indicating the distance passed over or travelled by the same.
767. J. C. Evans and P. Soames, Morden Iron Works, East Greenwich—Imp. in apparatus for superheating steam.
768. M. A. Muir, Glasgow, and J. Mcllwham—Imp. in moulding or shaping metals.
769. E. Dowling, Little Queen-street, Holborn—Imp. in weights.
770. B. Smith and C. L. Smith, Corbet's-court, Spitalfields—Imp. in the preparation of certain colouring matter, applicable for dyeing and printing.
771. J. Buckley, Horwick, Lancashire, O. Greenhalgh, and R. Hutchinson—Imp. in machinery or apparatus for printing woven fabrics.

Dated 28th March, 1859.

772. C. J. Richardson, 34, Kensington-square—Imp. in apparatus to be applied to chimnies or flues of buildings, for preventing downdraught or return smoke, for their insuring upward ventilation, and for reducing the quantity of smoke or the blacks from the smoke passing into the atmosphere.
773. C. F. Vasserot, 45, Essex-street, Strand—An improved diving apparatus. (A com.)
774. J. Buckingham, Westmoreland-house, Walworth Common, Surrey—Imp. in machinery or apparatus employed in drawing fibrous substances.
775. A. V. Newton, 66, Chancery-lane—An improved construction of furnace for reheating steel preparatory to the hardening, tempering, or annealing process. (A com.)
776. A. Turner, Leicester—Imp. in the manufacture of elastic fabrics.
777. A. V. Newton, 66, Chancery-lane—Improved apparatus for retaining the oil or other flued used for annealing, tempering, and hardening steel at an equable low temperature.

Invention with Complete Specification Filed.

814. F. P. A. Auburtin, 32, Gerard-street, Islington—An improved preparation of food for herbivorous animals.—1st April, 1859.

WEEKLY LIST OF PATENTS SEALED.

[*From Gazette, April* 8, 1859.]

April 8th.

2236. E. V. Rippingille.
2238. J. Mitchell, H. Mitchell, and T. England.
2240. A. Nicholls and T. Walker.
2247. F. W. Gerhard.
2256. J. Holroyd.
2257. C. F. Vasseret.
2259. J. Beattie.
2260. R. Cowen.
2261. J. L. Hancock and F. L. Hancock.
2266. T. Riddell.
2270. L. Wray.
87. L. Cowell.
89. A. Gordon.
2294. H. Martin.
2312. J. P. Gillard.
2335. W. E. Newton.
2369. R. Bodmer.
2377. F. Fowke.
2404. C. Pooley.
2533. A. V. Newton.
2717. J. H. Johnson.
2978. H. Hutchinson.
2980. A. V. Newton.
230. H. Brecknell and J. Dyer.
355. J. Aspinall.
406. W. E. Newton.
422. J. T. Jones.

[*From Gazette, April* 12, 1859.]

April 12th.

2274. G. Beadon.
2275. J. A. Gasse.
2283. A. Benda.
2285. J. C. Ollerenshaw.
2288. C. Cowper.
2293. S. Perkes.
2295. G. Baxter.
2297. S. Diggle.
2300. R. R. Jackson.
2302. G. Davies.
2309. F. J. Coulon and S. G. Giraud.
2316. A. Dunn.
2378. J. Robb.
2385. A. V. Newton.
2750. F. Fincham.
95. J. Gibbons.
280. J. Grimond.

Patents on which the Stamp Duty of £50 has been paid.

[*From Gazette, April* 8, 1859.]

April 4th.

814. R. Halliwell.
830. A. Morton.
842. A. Morton.
852. W. J. Curtis.
860. G. F. Morrell.

April 5th.

874. J. Nash.

April 6th.

843. W. Terry.

[*From Gazette, April* 12, 1859.]

April 7th.

884. R. Richardson.

April 8th.

888. J. Barrans.
948. J. Nasmyth.
973. W. P. Savage.

April 9th.

892. L. Kaberry and A. Horsefield.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
4157	March 10.	A Bottle or Roasting Jack	Gray and Bailey	Berkley-street, Birmingham.
4158	„ 16.	Automaton Mouse and Rat Trap	Colin Pullinger	Selsey, near Colchester.
4159	„ 26.	Shade for Candlesticks	Brecknell, Turner, and Sons	The Bee Hive, Haymarket, S.W.
4160	April 4.	Overcoat, to be called the Vienna Wrapper	Moore, Adams, and Peade	2, Friday-street, Cheapside, E.C.
4161	„ 5.	Self-sustaining Ear-Ring	Parkes and Fell	10, Upper Hockley-st., Birmingham.
4162	„ 12.	An Improved Drill	Taylor and Elvey	Edingley Southwell, Notts.
4163	„ 12.	A Pin or Skewer	Henry Parrich	Birmingham.
4164	„ 13.	A Machine for Charging Breech-loading Cartridges	George Jeffries	Golden Ball street, Norwich.